

LARGER FORAMINIFERA OF THE GENUS LEPIDOCYCLINA RELATED TO LEPIDOCYCLINA MANTELLI

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This paper contains a description of a new species of *Lepidocyclina*, *L. forresti*, from the Oligocene of Antigua, a description of a variety of *L. mantelli*, and notes on *L. mantelli*, *L. supera*, and *L. miraflorensis*, with illustrations of each of the species enumerated. All of these species belong to the subgenus *Lepidocyclina* in which the two initial embryonic chambers are characteristically of equal or subequal size and are separated by a straight wall. All the species here considered have hexagonal, subhexagonal, or more or less spatulate equatorial chambers.

All the described and figured specimens are the property of the United States National museum.

LEPIDOCYCLINA (LEPIDOCYCLINA) FORRESTI, new species

Plate 1, figs. 1-4, Plate 2, figs. 1-6

1920. *Lepidocyclina gigas* CUSHMAN (part), U. S. Geol. Survey Prof. Pap. 125 p. 63, pl. 19, fig. 4 (not figs. 1-3).

Description of cotypes, from east of Lynch Point, Willoughby Bay, Antigua.—Test thin, waferlike, with or without a very small umbo. Diameter of microspheric form 18 mm.: diameter of the macrospheric form ranges from about 9 to about 13 mm. Thickness through the center of the macrospheric form 0.75 mm. The surface of the cotypes is smooth, obscurely reticulate, entirely without papillae, except that a few small ones are present on the umbos of some specimens.

Embryonic chambers nearly equal, separated by a straight wall; outer wall moderately thick, about 0.025 mm.; greater diameter of the embryonic apparatus 0.60 mm., lesser diameter, 0.45 to 0.5 mm.

Equatorial chambers spatulate; either the radial or tangential diameter may be somewhat the longer. The radial diameter in the macrospheric form ranges from 0.075 to 0.10 mm., usually about

0.075 mm. As seen in a vertical section the chambers increase in height toward the periphery. In the macrospheric form, height next the embryonic chambers, about 0.05 mm., at the periphery 0.10 mm.

The number of layers of lateral chambers over the center in the macrospheric form on each side of the equatorial chambers, is 6 or 7, and decreases toward the periphery, there being for a distance of about 1.55 mm. from the margin no lateral over the equatorial chambers. The length of the chambers exceeds the height, with only obscure division into tiers. Pillars are absent or only weakly developed.

Description of paratypes from Long Island, Antigua (pl. 1, fig. 4, pl. 2, figs. 3-5).—*Lepidocyclina forresti* appears to be abundant in material from Long Island, Antigua. According to thin sections, which seem to represent the microspheric form (pl. 1, fig. 4; pl. 2, figs. 4-5), the thickness through the center is as much as 1.75 mm., and there are as many as 16 layers of lateral chambers on each side of the equatorial layer. Several specimens possess small papillae on the umbo. The macrospheric specimens are similar to the cotypes.

Localities and geologic horizon.—The cotypes are from material collected by W. R. Forrest, of Saint John, Antigua, on a small point about 5,300 feet east of Lynch Point, and about 1,000 feet west of the base of Hudson Point at an altitude of 15 to 20 feet above sea level. The rock is a cream-colored, finely granular limestone, packed with specimens of the species of *Lepidocyclina* described above. Mr. Forrest has sent me notes on the exposures between Soldier Point and Lynch Point, but the precise position in the section is not clear because of faulting and tilting or folding. The horizon is higher than that of the exposures west of Lynch Point, and Mr. Forrest thinks that it may be above the horizon of *L. canellei* and *L. vaughani* exposed in Half Moon Bay on the north side of Soldier Point, but he is not certain of this relation.

Other localities, Long Island, Antigua, collected by W. R. Forrest; Rifle Butts, Antigua, U. S. G. S. No. 6854, collected by T. W. Vaughan. The specimen from the last-cited locality was referred by Doctor Cushman to *L. gigas*. Oligocene, Antigua formation. The species appears to have considerable stratigraphic range within the Antigua formation.

Affinities.—*Lepidocyclina forresti* belongs in the same group of species as *L. mantelli* (Morton), *L. supera* (Conrad), and *L. miraflorensis* Vaughan. *L. mantelli* is a larger species and has longer lateral chambers; *L. supera* has well-developed pillars and papillae; and *L. miraflorensis* is more dome-shaped in the central part.

LEPIDOCYCLINA (LEPIDOCYCLINA) MANTELLI (Morton) Gumbel

Plate 3, fig. 1

1920. *Lepidocyclus mantelli* CUSHMAN, U. S. Geol. Survey Prof. Pap. 125, p. 57, pls. 12-14 (references to previous literature).
1924. *Isolepidina mantelli* H. DOUVILLÉ, Soc. géol. France, mém., n. s., vol. 1, mém. 2, p. 37, text figs 17 and 17 a-d.
1924. *Lepidocyclus (Lepidocyclus) mantelli* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, pp. 796, 797, text fig. 1.

There is no need for a redescription of the traditional *Lepidocyclus mantelli*, but there is reason for questioning whether the traditional *L. mantelli* is the true *L. mantelli*, for no expert on the genus has, so far as I know, restudied Morton's type. In *L. mantelli* as usually accepted there are no pillars and the lateral chambers are low and long, as shown on plate 3, figure 1. In these features it differs from the other American forms.

Geologic horizon.—Oligocene, Marianna limestone at many localities in Alabama and Florida, and probably in Mississippi.¹

LEPIDOCYCLINA (LEPIDOCYCLINA) MANTELLI (Morton) Gumbel, variety

Plate 3, figs. 2a, 2b, Plate 4, figs. 1-2

This variety differs from the traditional *Lepidocyclus mantelli* by having a finely papillate outer surface and small but well-developed pillars and by somewhat more open lateral chambers, as shown by plate 3, figures 2a, 2b, plate 4, figure 2.

Locality and geologic horizon.—Perdue Hill, above Claiborne Landing, Alabama River, Ala.; Marianna limestone; bed No. 3 of C. W. Cooke's section. Collected by C. W. Cooke.

Affinities.—This variety lies between the usually accepted *L. mantelli* and *L. supera*. It resembles the former except in the features above indicated and it is somewhat thicker in the umbonal region. It differs from *L. supera* by its greater diameter and by its less pronounced lenticular form. The differences are shown by plate 3, figures 2a, 2b.

This variety appears to come from the original locality of *Nummulites mantelli* Morton, and it may be the true *L. mantelli*, while the usually accepted *L. mantelli* may be a variety which has no pillars and no papillae on the surface. The type of the species, which is probably in the Museum of the Academy of Natural Sciences of Philadelphia, should be restudied.

¹ See Cushman, U. S. Geol. Surv. Prof. Pap. 125. p. 125.

LEPIDOCYCLINA (LEPIDOCYCLINA) SUPERA (Conrad) H. Douvillé

Plate 3, fig. 3

1920. *Lepidocyclina supera* CUSHMAN, U. S. Geol. Survey Prof. Pap. 125, p. 69, pl. 26, figs. 5-7 (references to previous literature).
1924. *Isolepidina supera* H. DOUVILLÉ, Soc. Géol. France, mém. n. s., vol. 1, mém. 2, p. 40, pl. 1, figs. 9, 10, text-figs. 23-26.
1924. *Lepidocyclina (Lepidocyclina) supera* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, pp. 797, 819, pl. 33, fig. 3.

The external features, the embryonic chambers, and the equatorial chambers of *L. supera* have been very well figured but no good illustration of a vertical section has hitherto been published. Therefore, such a section of microspheric specimen is given on plate 3, fig. 3. The test is smaller than that of *L. mantelli* and is more lenticular in form. The lateral chambers are low and are decidedly irregular in shape and size; the walls between successive layers vary greatly in thickness. Pillars are well developed.

Geologic horizon.—Byram marl, uppermost Oligocene, of Mississippi and Alabama; Glendon formation in Alabama and probably in Mississippi.

LEPIDOCYCLINA (LEPIDOCYCLINA) MIRAFLORENSIS Vaughan

Plate 4, figs. 3-5

1919. *Lepidocyclina vughani* (part) CUSHMAN, U. S. Nat. Mus.-Bull. 103, p. 93, pl. 37, figs. 1, 2, 3, and 5 (not pl. 37, fig. 4, nor pl. 38).
1923. *Lepidocyclina miraflorensis* VAUGHAN, Nat. Acad. Sci. Proc., vol. 9, p. 257.
1924. *Lepidocyclina (Lepidocyclina) miraflorensis* VAUGHAN, Geol. Soc. Amer. Bull., vol. 35, p. 797.

Since no adequate illustration of the equatorial chambers of this species has yet been published, that deficiency is here supplied; and figures of vertical sections are presented for purposes of comparison with the other species discussed in this paper. *Lepidocyclina miraflorensis* and *L. forresti* are closely related, but they are distinguished by important differences. In *L. miraflorensis* the central part of the test is more domed and the equatorial chambers increase more rapidly in height from the center toward the periphery than in *L. forresti*. In *L. forresti* the test is relatively more compressed and the diameter is greater.

Locality and geologic horizon.—The cotypes of *L. miraflorensis* were collected by Dr. D. F. MacDonald on the wagon road one-half mile south of Miraflores Station, Panama Canal Zone, U. S. G. S. locality No. 6255. The horizon is supposed to be the lower Miocene, Empeador limestone, but the stratigraphic position is not definitely known.

EXPLANATION OF PLATES

PLATE 1

Lepidocyclus forresti, new species

- Figs. 1-3. Cotypes from east of Lynch Point, Willoughby Bay, Antigua. Figs. 1 and 2, views of the surfaces of specimens, $\times 1.8$. The larger specimen in Fig. 1 is probably a microspheric individual. Fig. 3, embryonic and equatorial chambers, $\times 18.3$.
4. Paratype from Long Island, Antigua. Horizontal section of a microspheric individual, $\times 18.3$; shows pillars in the umbonal region, surface reticulations, and equatorial chambers.

PLATE 2

Lepidocyclus forresti, new species

- Figs. 1, 2. Cotypes, macrospheric individuals, from east of Lynch Point, Willoughby Bay, Antigua. Fig. 1, vertical section, $\times 18.3$. Fig. 2, embryonic chambers, $\times 18.3$.
- 3, 4, 5. Paratypes from Long Island, Antigua. Fig. 3, macrospheric individual, embryonic and equatorial chambers, $\times 18.3$. Fig. 4, microspheric individual, vertical section, $\times 18.3$. Fig. 5, peripheral portion of a specimen, probably microspheric, $\times 18.3$.
6. Embryonic chambers of a specimen from Rife Butts, Antigua, U. S. G. S. locality No. 6854.

PLATE 3

- Fig. 1. *Lepidocyclus mantelli* (Morton) Gumbel, as usually accepted; vertical section of part of a microspheric test, $\times 18.3$. U. S. G. S. locality No. 2636, Wayne County, Miss.
- 2a, 2b. *Lepidocyclus mantelli* (Morton) Gumbel, var.; two parts of the same vertical section of a microspheric test. Fig. 2b joins the lower part of Fig. 2a, $\times 18.3$; U. S. G. S. locality No. 6729, Marianna limestone, Perdue Hill, near Claiborne, Ala.; probably topotype of *L. mantelli*.
3. *Lepidocyclus supera* (Conrad) H. Douvillé; vertical section of a microspheric topotype, $\times 18.3$; Byram marl, U. S. G. S. locality No. 3722, Vicksburg, Miss.

PLATE 4

- Figs. 1, 2. *Lepidocyclus mantelli* (Morton) Gumbel, var., macrospheric forms. Fig. 1, embryonic and equatorial chambers, $\times 18.3$. Fig. 2, vertical section, $\times 18.3$. U. S. G. S. locality No. 6729, Marianna limestone, Perdue Hill, near Claiborne, Ala.; probably topotypes of *L. mantelli*.
- 3, 4, 5. *Lepidocyclus miraflorensis* Vaughan, from U. S. G. S. locality No. 6255, half a mile south of Miraflores Station, Panama Canal Zone. Fig. 3, horizontal section, $\times 18.3$, to show equatorial chambers and surface reticulations. Figs. 4, 5, vertical sections, $\times 18.3$.